



**ADVANCED SCIENCE AND TECHNOLOGY INSTITUTE**

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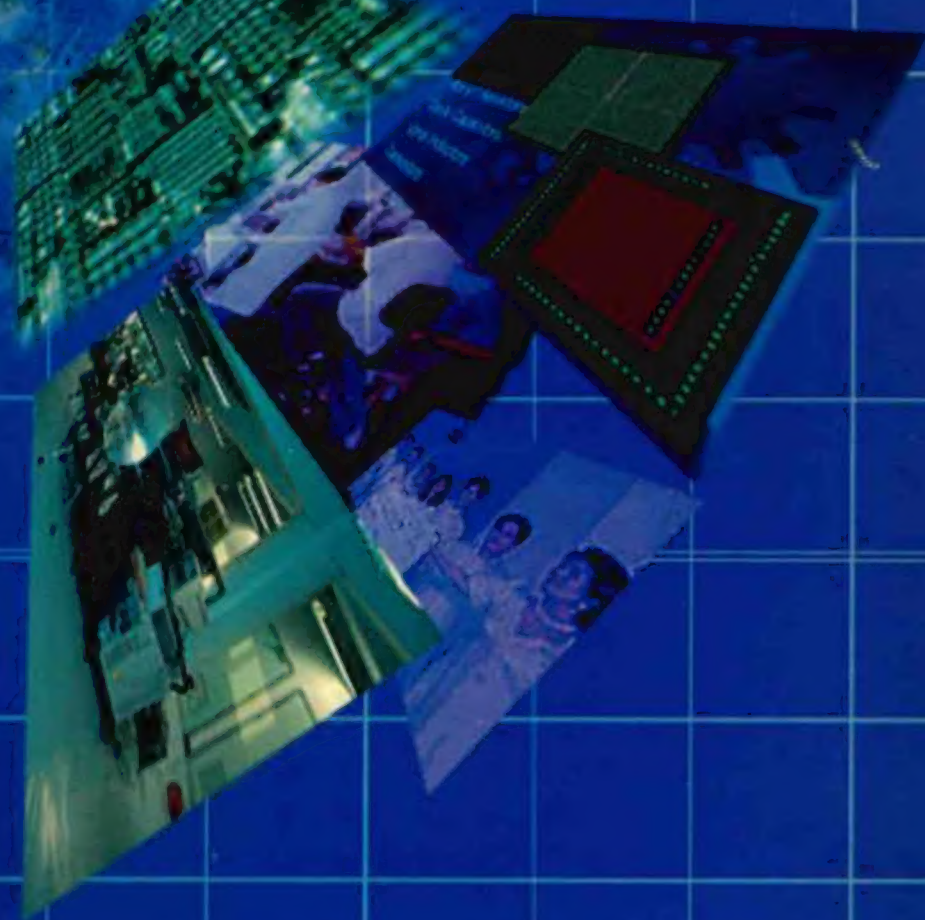
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# Annual Report 2000



ADVANCED SCIENCE AND TECHNOLOGY INSTITUTE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY

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# *Table of Contents*

2	Message from the Director
3	Introduction
4	Highlights of Accomplishment
6	Implementation of High Priority Flagship Programs
14	Strengthening and Sharpening Focus of Continuing Programs
19	Improvement of S&T Governance, Management and Linkages
20	Financial and Human Resources Management
24	Challenges and Directions
27	Organizational Profile
29	Organizational Chart
30	ASTI Staff
32	Directory of Key Officials



**From DR. DELFIN JAY M. SABIDO IX**  
**Advanced Science and Technology Institute**



It was in November 1999 that I took on the paramount challenge of becoming the Institute's 7<sup>th</sup> Director. For this, I also assumed the responsibility of leading the Institute in fulfilling its mandate, which is to perform research and development in the fields of Microelectronics and Information and Communications Technology, in line with the goal of national development.

Inspired by the numerous accomplishments in the past 12 years, year 2000 marked the implementation and completion of projects all aimed at making our local industry globally competitive. Internal reorganizations were carried out to make certain that the Institute's resources are maximized. Units and teams were created to focus on the Institute's management and marketing aspects. Operations were being made to be more transparent and efficient

through consultation-meetings and reporting. Partnerships with other agencies both local and international were forged to strengthen the efforts initiated in line with the Institute's mandate and mission.

For year 2000's achievements, I extend my gratitude to the staff for their commitment and dedication, our partners from the academe and industry as well as the Department for their support.

Year 2001 will be more challenging for the Institute since the government has recognized ICT as the key to finding our niche in the 21st century and as a way to boost the country's productivity.

For year 2001, the Institute envisions to do more responsive R&D in its areas of concern and to continuously build new and strengthen existing linkages all geared towards finding a place for the Philippines as a leader in this fast changing global technological environment.

In behalf of ASTI's officials and staff, I am pleased to present our 2000 Annual Report.

*Delfin Jay Sabido IX*

The **Advanced Science and Technology Institute**, one of the line bureaus of the Department of Science and Technology (DOST), was established in 1987 by virtue of Executive Order 128. Its mandate is to conduct scientific research and development in the advanced fields of studies such as Microelectronics and Information and Communications Technology. Its mission is to improve the quality of life through equal access to information using research and development in information and communication technology.

**ASTI** envisions to create an environment that encourages collaborative R&D activities in basic science and in new and emerging technologies. It also seeks to provide a platform for experimentation of innovative network applications and services such as e-commerce, distance education and telemedicine.

**ASTI**, true to its mission and vision, continuously seeks new and advanced technologies that would make the country globally competitive in the field of ICT and Microelectronics. **ASTI** has defined its plans in line with the demands of the Information Age and New Economy and in recognition of the reality that IT-enabled services are the niche where the Philippines can attain market leadership.

Efforts of the Institute are all aimed towards:

- Establishing leadership in our areas of concern by formulating and advocating courses of action for the research, development and adoption of ICT in the Philippines,
- Strengthening and sustaining partnership with academe, government, and industry through collaborative Research & Development, and technical training,
- Carrying out proactive search and acquisition of strategic and relevant technologies through technology intelligence,
- Conducting proactive assessment of strategic and relevant technologies through market research, and
- Promoting the awareness and appreciation of scientific Research & Development.



Young, committed and dynamic individuals compose ASTI's goal-driven workforce.



Year 2000 was another challenging and busy year for the institute. The Department of Science and Technology (DOST) has entrusted to ASTI the implementation of three of its priority projects under the Comprehensive Program to Enhance Technology Enterprises (COMPETE). Essentially, ASTI took a crucial role in fulfilling the objectives of the Virtual Center for Technology Innovation (VCTI) in Information Technology as well as that of the VCTI in Microelectronics.

The initial phase of the establishment of ASTI's Philippine Research, Education, and Government Information Network (PREGINET), an initiative under VCTI in Information Technology, was carried out in June 2000. PREGINET is envisioned to be the catalyst in bridging the digital divide between the urban and rural communities, between the cities and the countryside. This network will connect academe, research agencies, and government institutions through a nationwide broadband network to enable e-governance and strengthen the country's science and technology capability. The network can also be instrumental in improving the delivery of public services and information to the business community and to the Filipino people, in general.

The year also marked the realization of the goal of developing locally designed integrated circuits through the ASTI-led projects under VCTI in Microelectronics. With the end target of shifting the local electronics industry from offering contract services to original design manufacturing and enabling them to produce globally competitive products, the VCTI Microelectronics Design Laboratory was established. Such facility has been utilized in designing a RISC Core Processor - the "brain" of the System-On-a-Chip (SOC). This SOC is an integrated circuit that can be used in network appliances and wireless devices.

Development of other sub-systems that are needed to generate the SOC have been addressed by the RF Microelectronics for Wireless Technologies project. This project is aimed at improving the country's technical capabilities in wireless technologies and in the process develops products and modules for the highly competitive and prospering wireless technology market. Aside from Developing Capabilities in RF Microelectronics, research activities were also being pursued to come up with Digital Microwave Radio and Bluetooth™ Protocol Stack. Eventually, all these efforts will converge toward the development of the first locally designed System-on-a-Chip which is expected to generate economic, financial, and technological benefits for the country.



Network Diagram being implemented by the PREGINET project. Lines show the connections to the different access points of the country.

In pursuit of the agency's mission of improving the quality of life of the Filipino people through equal access to information using research and development, ASTI identified Information and Communications Technology (ICT) as one of its priority programs. This program covers projects focusing on advanced network research, wireless technologies, and network applications and software. In the year 2000, a total of ten (10) ICT projects were implemented. Of these projects, three (3) have been completed while the rest are still in progress. Strengthening capabilities in ICT research is essential to enable the country to improve the competence and competitiveness of local telecommunications and software industries.

An equally indispensable program of the institute is the Microelectronics Program. This research program hopes to develop technologies that would increase value added to products being manufactured by local electronics industry and to transfer the technical know-how to Filipino engineers. So far, six (6) R&D projects have been undertaken under the program, four (4) of which were already completed.

To ascertain that all research outputs are made available and accessible to its target clients, ASTI identified Technology Transfer as another major concern. This program implements strategies or mechanisms that would ensure that the knowledge acquired and technologies or products developed from carrying out the research and development works are transferred to industry. The newly created Business Development Unit (BDU) has been tasked to carry out this program.

Supporting the project planning, execution and control aspect of the Institute also called for better management of the Institute's undertakings. Another sub-group, the Project Management (PM) Group, was created specifically to ensure that projects are completed efficiently.

With these innovative milestones, ASTI has made remarkable strides in enhancing its technical capability and developing ICT and Microelectronics technologies. These research achievements will certainly benefit the industry particularly in its drive towards establishing a competitive advantage in certain market niches. Toward this end, ASTI will continue to develop technologies, services and products that would reap global recognition, economic and social rewards for the Philippines.



The satellite dish for the AI3 project is located at the rooftop of the ASTI building.

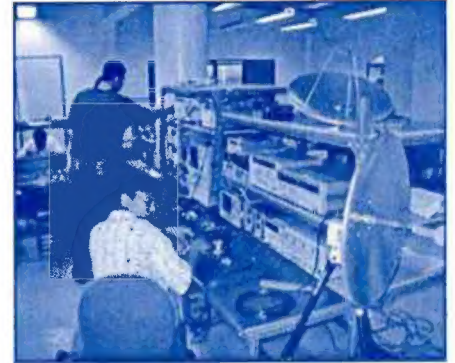


## Comprehensive Program to Enhance Technology Enterprises (COMPETE) Project

### Virtual Center for Technology Innovation (VCTI) in Microelec- tronics

#### Radio Frequency (RF) Micro- electronics for Wireless Technologies (New)

Three major research undertakings were carried out under this project to address the devices, system design and applications aspects of wireless technologies. These were:



DMR team testing the accuracy of their RF transmitters and receivers.

#### Design and Development of Digital Microwave Radio or DMR

This project component focused on the development of a test bed for the Multichannel Multipoint Distribution System (MMDS) infrastructure operating within the frequency range of 2 to 3 GHz. The project investigated RF devices and circuits, modulation and demodulation schemes, signal processing, and coding. The results obtained in the design and construction of RF and microwave devices for MMDS were comprehensively discussed in the paper entitled *"Design and Characterization of a Broadband Subcarrier Multiplexed 2.375 GHz Wireless Link"*. This paper was presented in the First Asian International Mobile Computing Conference (AMOC 2000)

held on 31 October to 3 November 2000 in Penang, Malaysia. The project team also came up with another paper on *"Design and Construction of a Broadband Wilkinson Power Divider/Combiner"*, which was published in the Philippine Engineering Journal in June 2000 and was submitted to ECE Conference 2000 organized by De La Salle University on December 1 & 2, 2000. These were also presented during the Academic-Industry Conference on ICT held at U.P. Diliman on 13 December 2000. Among those papers presented were entitled *"2.375 GHz Broadband Subcarrier Multiplexed Wireless Link"*, *"Experimental Investigation of the Impact*



DMR Team's work and testing area. The area is static electricity free to protect sensitive devices being used.

# Implementation of High Priority Flagship Programs

of Crosstalk and Error Correction on the Performance of a Low-Cost ISM-Band Subcarrier Multiplexed Broadband Digital Microwave Radio Link", and Implementation and Characterization of a 2 Mbps,  $\pi/4$  DQPSK Modem on a 2.4 GHz Microwave Link".

## Developing Capabilities in RF Microelectronics

In pursuit of the project's goal of establishing the design foundation and knowledge base for RF Microelectronics, the team studied and gained confidence and proficiency on the use of design software tools for schematic entry, simulation, and lay-out of circuits. Two configurations of a Low-Noise Amplifier (LNA) and a single-balanced RF mixer were designed. In addition, several types of resistors, capacitors and inductors, and design-for-test modules were designed. These designs were submitted to a foundry abroad for fabrication using 0.6 micron CMOS process last December 2000. The paper entitled "CMOS RF Mixers and Low-Noise Amplifiers" was presented in the Academe-Industry Conference on ICT.



Schematic diagram of a single-ended CMOS low-noise amplifier.

## Design and Implementation of a Bluetooth™ Host-side Protocol Stack using Formal Methods

Late this year, a team of ASTI researchers started conceptualizing a proposal on Bluetooth™ technology. Bluetooth™ is the latest networking standard being used for communicating wirelessly in short distances. The initial target of the team is to come up with a protocol stack or a software application that will demonstrate the technology. Developing this highly marketable protocol stack would enable local researchers to gain technical know-how about this new enabling technology.



Engr. Louis Alarcon of the UP College of Engineering was among the instructors of the VCTI-ASIC Design Laboratory First Workshop on Basic Digital VLSI Design Process whose primary aim is to develop capability in IC design.

## Microelectronics Design for Philippine Electronics Industry, An Essential Component for Global Competitiveness (On-going)

This project involved setting-up of an Application Specific Integrated Chip (ASIC) Design facility at ASTI. The design laboratory is envisioned to be-



# Implementation of High Priority Flagship Programs

come a world class training center where Filipino integrated circuit (IC) designers can do quality research and development work. In pursuit of this goal, state-of-the-art equipment and software were acquired. Through this facility, the center conducted training workshop on *ASIC Design using Cadence* (3-19 April 2000) and *Basic Digital VLSI Design Techniques* (4 June—7 July 2000) for prospective trainors. The participants were composed of 25 engineers and faculty members from ASTI, academe and industry. The project team also developed course materials that will be used in future training and seminars to be conducted by the center. In terms of research and development, the VHDL model of a 5-staged pipelined RISC processor, VHDL model of a 1/2 Viterbi Encoder/Decoder, and design-for-test modules were synthesized on a Field Programmable Gate Array (FPGA) and in silicon. The integrated circuit design developed will be sent to an IC foundry for fabrication on the 1st half of 2001. All technical developments under this project were exhaustively discussed in 8 technical papers, which were published in the Philippine Engineering Journal, ECE 2000 Conference (De la Salle University), and HDL Conference 2001 (San Diego, California, U.S.A.).

## Virtual Center for Technology Innovation (VCTI) in Information Technology

### High-Performance Research and Education Network or PREGINET (New)

The project focused on the establishment of the Philippine Research, Education, and Government Information Network popularly known as PREGINET. This network will provide more consistent and better security for the network connectivity of various local re-

search, education, and government institutions and will become the country's connection to various research institutions worldwide. During the first seven months of operation, the project concept and network design was presented to different telecommunication companies, universities, and government institutions. The application for the license to install and operate a wireless broadband data network as a research testbed was also filed at the NTC. To aid the project team in the selection of exchange points and access points, a survey of existing resources and infrastructure of different institutions in the region was conducted. Meetings and dialogues with the target beneficiaries of the network were conducted in Cebu, Davao, Tacloban, and Cagayan de Oro. Based on the survey results and actual site-visits, a preliminary list of exchange points and regional access points in Luzon, Visayas, and Mindanao was drawn.



Demonstration of videoconferencing and chat, two of the initial services being provided by PREGINET

## Other COMPETE- Related Projects

### Information and Communications Technology (ICT) Program

#### **Philippine Partnership with the Asian Internet Interconnection Initiatives Project (AI3) (On-going)**

During the early part of the year, the AI3 Philippine node was established at ASTI. Network communication with Philippine partners was also developed. Through the AI3 network, the following research experiments were conducted: (1) graphing of link state of AI3 connection; (2) development of monitoring software for SDM300 Satellite modem and C-star ODU; (3) satellite link simulation research; (4) setup of IPv6 (Internet Protocol Version 6, which is designed to be an evolutionary step from the current IPv4) generic tunnel; (5) documentation of IPv6 implementation; (6) implementation of IPv6 linkup through AI3 connection; (7) evaluation of desktop conferencing solution; (8) H.323 desktop video conferencing research; (9) Unidirectional Link Routing (UDLR) experimentation; (10) Border Gateway Protocol (BGP) Routing on AI3 Link; and (11) Multicast routing experimentation. In September, a demonstration of AI3 network was held at ASTI and was attended by representatives from the government and academic institutions. Among the technologies presented were: (1) Satellite Image Database (SAIDaB) System which provides the user the free search and retrieval capability of satellite images via the world wide web; (2) Bio-mirror project which provides high-speed access to up-to-date DNA & protein biological sequence databanks; (3) Internet Protocol Version 6 (IPv6); (4) Link Monitoring which involves implementation of software tools to monitor and evaluate research network traffic across links to the AI3 network testbed; and (5) Video conferencing with AI3 Partners which was held to demonstrate the capability of the network to accommodate multimedia traffic over IP to other AI3 member countries.



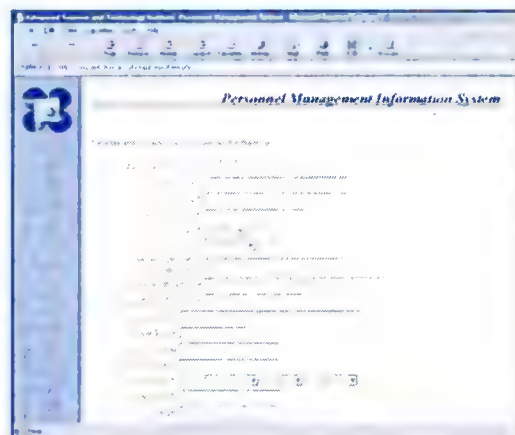
Network monitoring and server room with Mr. Christian Gueco, one of the project staff of AI3.



# Implementation of High Priority Flagship Programs

## Management Information System (MIS) Re-engineering (On-going)

During the year, the design and development of the following on-line modules were completed; (1) application for employment; (2) leave (3) resignation; (4) daily time record (DTR); and (5) MIS for the Office of the Director. The employment application module is capable of on-line filing and evaluation. The application and approval of leave as well as management of leave credits were also automated. Meanwhile, the DTR module is capable of processing data from the log box; displaying complete log information of all employees; automatic computation of man-hours, undertime, overtime, and absences; automatic e-mail notification for employees with excessive number of absences and/or undertime. The MIS developed for the Office of the Director has document archives and project archives. Other activities undertaken dealt with the development of a system for Gov.PH registration, installation of Oracle on Windows 2000 platform, and a web-email gateway. In line with this endeavor, the ASTI-MIS group participated in the PCASTRD-led project entitled "Strengthening the DOST Management Information System and Information Delivery Infrastructure—Phase I". The team was involved in the overall supervision and monitoring of the technical aspect of the said project.



Online application form for the Personnel Management Information System.



Screen shot of the MTS software showing available weather data templates.

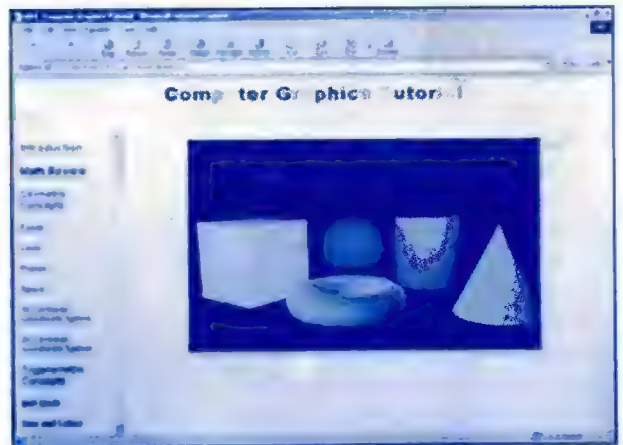
## Cooperative Venture for the Enhancement and Y2K Compliance of PAGASA's Meteorological Telecommunication Systems (MTS) (On-going)

ASTI has already developed the software that is adaptable to the existing computers and processors of PAGASA. The software is automatic and is capable of controlling remote hardware and communication equipment. Deployment and field testing has been deferred due to delayed release of funds. Once the whole integrated system is fully operational, it will provide PAGASA with a reliable and efficient means of gathering accurate and timely weather data.

# *Implementation of High Priority Flagship Programs*

## **CD-ROM Authoring Phase II: Virtual Reality (Completed)**

An educational CD-ROM containing 3D graphics library tutorials on 3D programming was developed. The tutorials are available over the Internet through a web site.



CD-ROM Authoring Phase II will be useful in areas such as simulations, visualization, education and training. The site is accessible at <http://graphics.asti.gov.ph>

## **Internet Telephony (Deferred)**

The implementation of activities scheduled for CY 2000 was deferred since efforts were concentrated on the PREGINET project whose applications component includes internet telephony.

## **1.5 GHz Point-to-Point TDMA Microwave Radio (Terminated)**

This project was terminated. Nonetheless, initial research efforts done under this project were incorporated with the "Digital Microwave Radio" project under VCTI-RF Microelectronics for Wireless Technologies.

## **Digital Signal Processing for Rural Telecommunications (Completed)**

Project documentation was already completed. The outputs generated by this project will be used in the newly approved "RF Microelectronics for Wireless Technologies".

## **Microelectronics Program**

### **Developing Capabilities in Microelectronics Research and Development of Various Engineering Schools in the Philippines (Completed)**

ASIC design tools were distributed to the participating academic institutions namely, University of Santo Tomas, Saint Louis University, University of San Carlos, and Mindanao State University to provide their students opportunity to acquire hands-on experience in integrated circuit design. These





# Implementation of High Priority Flagship Programs

tools will also aid the faculty members in teaching microelectronics design, implementation, verification, and test.

## Application Specific Integrated Circuits (ASIC) Design for Telecommunications (Completed)

Documentation of project activities was already prepared. Knowledge acquired and technical outputs generated through this project were being used in the project "RF Microelectronics for Wireless Technologies".



The Field Programmable Gate Array - based line interface card for the Institute's Private Automatic Branch Exchange.

## Upgrade of ASIC Design Tools and Methodology (Completed)

The acquisition of the timing module for the Leonardo Synthesis software has enabled the institute to enhance its existing design tools and to further refine the methodology being used to design Application Specific Integrated Circuit (ASIC). This improved ASIC design methodology will be disseminated to the academe and industry through training.

## Fine Tuning of Printed Circuit Board (PCB) Fabrication Facilities (Completed)



Mr. Renato Catinguil, SPD personnel performs quality check on a finished printed circuit board.

The Special Projects Division of ASTI established a Printed Circuit Board (PCB) laboratory for the purpose of having the capability of fabricating PCBs. This prototyping facility enabled ASTI to fabricate PCBs for the use of its various electronic projects. The reason for setting-up such facility is the lack of a locally available PCB prototyping services that meets the quality and quantity required by ASTI projects. Although such services exist abroad, their costs are somewhat prohibitive. ASTI has foreseen that such a service may be valuable to the industry and the academe. In fact, ASTI has been offering the service informally to

# *Implementation of High Priority Flagship Programs*

the private sector and some schools. ASTI, therefore, has realized that there is such a demand for a PCB prototyping service that would cater to those who need access to quality PCB prototypes in very low volumes. ASTI further envisions offering the service on a commercial scale.

## **Process Development for Multilayer Printed Circuit Board Fabrication (New)**

During the latter part of the year, the institute initiated the development of a working process for multilayer printed circuit board (PCB). The project team identified Dry Film Technology as the system of fabrication to use because it offers good latitude in terms of trace width and spacing. Other technologies involved include Photoplotting, Through Hole Plating, Solder mask and Component label Application.



The Multipress is the machine used to bond all layers of a multilayer PCB through application of heat and pressure.

## **Other Projects**

### **Eartest Enhancement (Completed)**

Both the hardware and software designs of the Eartest were enhanced to improve its reliability, reduce its cost and increase its sensitivity. This device can be adopted by the health sector for a more sensitive, cost-effective, faster, and readily implementable universal screening procedure to identify hearing impairment cases.



## Technology Transfer Program

### Contract Researches

#### Development of a Table Top Breast Milk Pasteurizer, Prototype II (Completed)

ASTI completed the development of the second prototype. The alterations made included integration of the control box to the vessel, modification of the vessel enabling the inside bowl is able to completely submerge a 4 oz. baby bottle, and use of a different microcontroller that is currently available in the market. The Pasteurizer II can now accommodate a maximum of 24 bot-



The Pasteurizer destroys **bacteria** while preserving vital immunoglobulin and **lysozomes** in donated breast milk.

tles compared to the original 8 bottles. The Tabletop Breast Milk Pasteurizer can be used in local hospitals to boost the breast-feeding program of the government. Since its cost is lower by 90% than its foreign counterpart, local hospitals and clinics can easily obtain the product. Mothers who are hesitant to give their children donor milk can now be assured that the milk that comes from donor mothers is safe. Prototype II is currently being used at the Philippine Children's Medical Center (PCMC). PCMC is exploring the possibility of commercializing this pasteurizer for distribution to government hospitals nationwide.

#### Home Caller System (New)

The home caller system (HCS) enables telecommunications service operators to verify and log subscriber information during operator-assisted calls. The system being developed consists of operator console/dialer, HCS server software, and mediation server. To date, HCS Server and PC-based Console were designed and tested with the Hicom 300 switch of Seimens-ETSI. Dialing, call transfer, and consultation were done using the console. Coding of the mediation server was also finished and this was tested in Cruztelco office in Taytay, Rizal using their Hicom 100 Switch. Up for implementation is the pilot testing of the whole system in Cruztelco office in Dumaguete City and the project documentation.

# *Strengthening and Sharpening Focus of Continuing Programs*

## **Consultancy Services**

### **SITA Access Point (On-going)**

Innovatronix implemented this project in consultation with ASTI. The institute has supervised the system design, implementation, and testing of the prototype for the SITA Access Point. The system still has to undergo final testing.

### **Computer Networking of Public High Schools in Quirino Province (Completed)**

Quirino State College implemented the project, which aims to interconnect secondary public schools in Quirino Province. The project team sought the assistance of ASTI in the preparation of network design, evaluation of proposals from bidders, and technical oversight during project implementation of this project. ASTI also participated in the inspection of the installed network and during the operational phase of the network.

### **Fisheries Resource Management Project (FRMP) (On-going)**

ASTI has been providing technical assistance to Bureau of Fisheries and Aquatic Resources for the proper implementation of the radio communication system of the FRMP. A technical group from ASTI prepared the network design and assisted in the preparation of the equipment specification. They also participated in the technical evaluation of bids for major technical equipment. In December, site visits in Davao and Lagonoy (Bicol) gulfs were conducted. Preparation of bid specifications is now in the final stage.

## **Training Programs**

### **Summer Internship Program**

Forty-one (41) college students benefited from this year's Summer Internship Program (SIP). The SIP supports the President's Summer Youth Work Program (PSYWP). Trainees were from U.P. Diliman, Centro Escolar University, Computronix (Dagupan City), AMA Computer College, and St. Joseph College. Some of them were given opportunity to participate in the research activities of the institute while others were involved in the administrative operation.



Participants of the Summer Internship Program on their Graduation Day.



# *Strengthening and Sharpening Focus of Continuing Programs*

## **PCB Services**

The Printed Circuit Board Laboratory is an in-house facility for fabrication of small quantities of PCB prototypes. It was built primarily as a support facility for the various projects of ASTI's technical divisions. Aside from being a support facility to internal projects, the laboratory also extends services to other institutions outside of ASTI. These services include single- and double-sided PCB fabrication, photoplotting, phototool fabrication, dry filming and milling. For this year, beneficiaries of such services include private companies like the Grand Circuit Industry, Integrated Microelectronics Incorporation, Innovatrix, Vicon, Easix, as well as the academe.



The library provides the latest materials in advanced technology.

## **Access to Facilities**

The library is frequently visited by a number of students, engineers, teachers and researchers from various schools to have access to its wide collection of engineering and computer books, scientific journals and other periodicals.

The Institute has been a regular destination of engineering students from all over the country. ASTI also rendered its facilities and equipments to the academe and private companies for their projects and researches.



Mr. Denis Villorente presenting his paper, The AI3 project at the ICT "Mindlink" Conference at UP Diliman.

## **S&T Promotion**

The Institute continued to actively participate in promotional activities like exhibits/trade conferences such as, the NSTW 2000 in Metro Manila and the DOST Visayas Cluster Fair in Cebu. Such activities were the venue in promoting and featuring ASTI-developed technologies. ASTI together with the Department of Science and Technology and the National Academy of Science and Technology Philippines

# Strengthening and Sharpening Focus of Continuing Programs

(NAST) spearheaded the promotion and development of a knowledge-driven economy for the country through a conference held last May 2000.

Other promotional activities engaged by the Institute were the development and dissemination of printed materials, like the Annual Report, brochures, newspaper write-ups, radio interviews, presentation of technical papers in both local and international conferences and television guestings.

Among the technical papers printed and presented by the Institute for the Year 2000 are the following:

## ***Papers published in the Philippine Engineering Journal, Volume XXI, Number 1: June 2000***

- *Design and Construction of a Broadband Wilkinson Power Divide/Combiner* by Guevarra, R. C.
- *Implementation of a Prototype ADSL System Using TI TMS320C6X DSP* by Manlapat, A. A., Santos, C.G. G., and Wong, I. C.
- *MP3 Decoder Using TI TMS320C6X DSP Chip* by Galang, B. H., and Quiwa, L. Q.
- *Shifting to Innovation: Putting the Philippine Microelectronics Industry at the Forefront of Development* by Tabangcura, M., Rafacon, M., Tan Chin, J., Chio, A., Descallar, W., Garcia, R., Lee, L., Sarte R., Valentus, V., Alarcon, L. (Alarcon is from the Department of Electrical and Electronics Engineering-UP Diliman).
- *Text and Binary Data Transfer Using Postfix and UUCP Over an HF radio Link* by Cabeza, I., Caccam, A.M., Antonio, M., De La Cruz, R., Durmiendo, R.
- *Viterbi Convolutional Error-Correcting Coder-Decoder* by Chio, A.A.P., Alarcon, L. (Alarcon is from the Department of EEE-UP Diliman)

## ***Technical Papers presented:***

- *Design and Characterization of a Broadband Subcarrier Multiplexed 2.375 GHz Wireless Link* by Guevarra, R. and Sabido, D.J. IX. Presented at the Asian International Mobile Computing Conference Penang Parkroyal Resort, Penang, Malaysia on 31 October - 3 November 2000. The same paper was presented in the First Na-



# *Strengthening and Sharpening Focus of Continuing Programs*

tional ECE Conference, DLSU on December 1, 2000 and at the ICT "MindLink" Conference at UP Diliman on December 13, 2000.

- *Design of an X-band Low Noise Amplifier* by Toledo, N. Presented at the First National ECE Conference, DLSU on December 1, 2000.
- *Implementation of a Prototype ADSL System using TI TMS326C6X DSP* by Manlapat, A.A. , Santos, C.G.G, Wong, I. C. Presented at the First ECE Conference, DLSU on December 1, 2000.
- *Design and Characterization of a 3.07 GHz QPSK Transmitter* by Toledo, N. Presented at the ICT "MindLink" Conference, UP Diliman on December 13, 2000.
- *Experimental Investigation of the Impact of Adjacent Channel Interference and Error Correction on the Performance of a Low-Cost ISM Band Subcarrier Multiplexed Broadband Digital Microwave Link* by Sabido, D.J.IX, Manlapat, A., Chio, Azaleah Amina; Santos, C. G. ; Galang, B.; Toledo, N.; Guevarra, R.; Wong, I. . Presented at the ICT "MindLink" Conference, UP Diliman on December 13, 2000.
- *The A13 Project* by Villorente, D. . Presented at the ICT "MindLink" Conference, UP Diliman on December 13, 2000.
- *CMOS Radio-Frequency Mixer and Low Noise Amplifier* by Sison, Lloyd T., Andres, P., Beleno, I., Fernandez, M., Guevarra, R., Wong, I. . Presented at the ICT "MindLink" Conference, UP Diliman on December 13, 2000.

### **Information Technology and Electronic Commerce Council (ITECC)**

The Director of ASTI sits as a member of the Human Resource Cluster and the Physical Infrastructure Cluster of the Information Technology and Electronic Commerce Council or ITECC. This Council is mandated to transform the Philippines into a knowledge-based economy by harnessing the potentials of information and communications technology. It oversees implementation of the National Information Technology Action Agenda for the 21<sup>st</sup> Century (IT21), the Internet Strategy of the Philippines (ISP.com) and the Government Information Systems Plan (GISP). It also provides direction and support for researches on various aspects of information and communications technology and E-Commerce.

### **ASEAN Committee on Science and Technology (COST) and the Sub-Committee on Microelectronics and Information Technology (ASEAN-SCMIT)**

ASTI represents the country in the ASEAN-SCMIT. This is one of the sub-committees of the ASEAN-COST, which is responsible for the coordination, evaluation, and implementation of regional programs and projects proposed through the Committee.

### **Cooperative R&D Network for Robotics (Soccer Robot)**

ASTI participated in the coordination of this project with the support of the Philippine Council for Advanced Science and Technology Research and Development. Among the recent accomplishments of the project were the following: (1) conduct of demonstration games in De La Salle University and U.P. Diliman; (2) participation of the Philippine team in the FIRA Asia-Pacific Cup 2000 held in Singapore on May 23 – 25, 2000; (3) friendship game between RP and Korea, which is one of the highlights of this year's National Science and Technology Fair; and (4) participation in the FIRA Robot World Cup 2000 held in Rockhampton, Australia where the Philippine team won gold in the Millennium Challenge category and silver in the Benchmark category.

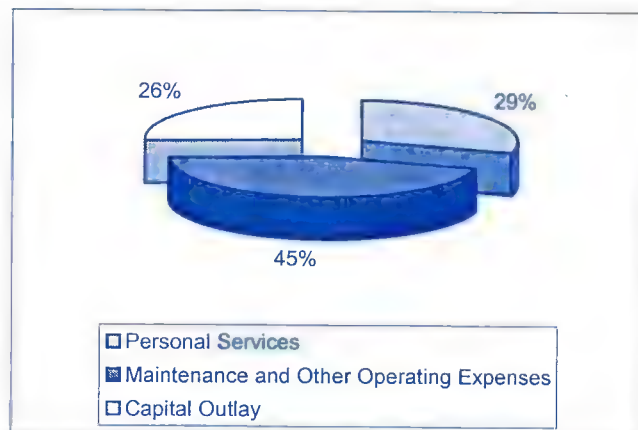


Dr. Elmer Dadios of DLSU lecturing on robotics at ASTI. A demonstration followed the lecture.



## Finance

The total appropriation for FY 2000 amounted to **P 23,081,000.00**. Of the total allotment released, which reached to **P 30,160,405.52**, for FY 2000, **P 8,839,541.60** was allotted for Personal Services; **P 9,705,865.40** for Maintenance and Other Operating Expenses; **P 5,300,000.00** for Capital Outlay; and **P 6,314,998.52**, which is the continuing appropriation from 1999.



A pie chart showing allotment per category in **percentage**.

Obligations incurred amounted to **PhP 20,773,399.51**. Of this amount, **P 8,522,797.29** went to Personnel services, **P 4,077,874.92** went to Capital Outlay, and **P 8,172,727.30** went to Maintenance and Operating Expenses. Unobligated allotment/balance amounted to **P 9,387,006.01**.

## Human Resources Development

### Staff Profile

ASTI is the smallest line bureau of the DOST in terms of manpower. It is allocated 49 plantilla positions, 39 (83%) of which are filled up as of December 31, 2000. The organization is composed of 17 technical staff or 44% and 19 support personnel. Gender-wise, majority of the 2000 permanent staff is comprised of males (54%).

In keeping with its mission to become a national center of excellence, the organization provided opportunities for continuous development of capabilities and knowledge to its staff. They pursue postgraduate education and participated in trainings, seminars, conferences and various fora here and abroad to enhance their capacities, knowledge and experiences to effectively carry out the organization's programs and projects.

As of December 2000, two personnel are close to completing their Masters degrees while another six are at various stages in achieving the same. Among the fields of specialization taken are as follows: Electrical Engineering, Business Administration, Computer Science, and Management Engineering.

The staff complement of ASTI is also composed of contractual employees from its various projects. As of December 31, 2000, they numbered 33 or 46% of the Institute. Female staff comprise 42%. Majority of the contractual staff are hired under the COMPETE Program of the Department, in particular, the Virtual Centers of Technology Innovation in Microelectronics and Information Technology.

Following is a list of courses and seminars sponsored/ conducted by ASTI:

TITLE OF TRAINING/ WORKSHOP/DEMO	PARTICIPANTS
Cadence Training	ASTI-VCTI Staff and UP-Engineering
VCTI-ASIC Design Laboratory First Workshop on Basic Digital VLSI Design Process	VCTI Staff, Industry and Academe
HyperText Markup Language	PSYWP Trainees, Students
AI3 Network Demonstration	Government, Industry, Academe, Media

Following is a list of the major courses and seminars participated in by the staff.

## TECHNICAL TRAININGS

### DOMESTIC

COURSE / SEMINAR	ORGANIZER
Cisco Networking Program (VCTI-IT Training)	Department of Science and Technology
Cisco Trainors' Seminar-Convention	Department of Science and Technology
Symposium on computer communication and Information Technology	IECEP
JAVA Talk	JAVA
iDevelop 2000 Seminar Series	Oracle
Intel Philippines Technical Symposium	Intel Philippines
PhilWAP Wireless Seminars	Philippine WAP Users Group
World Metrological Organization Format	PAGASA



**INTERNATIONAL**

<b>COURSE / SEMINAR</b>	<b>ORGANIZER</b>
DOST-Japan Society for the Promotion of Science (JSPS) Exchange Program	DOST and JSPS Philippines
ASEAN-Republic of Korea (ROK) Workshop on Microelectronics	ASEAN-Republic of Korea
CDMA (Code Division Multiple Access) Technology Training	Korea Int'l Cooperation Agency
Short-term training course for Asia-Pacific Multilateral Cooperation in Space Technology Training	China National Space Administration and the UN Office for Outer Space Affairs
Asia-Pacific Advanced Network (APAN) Conference 2000	APAN
Internet Application Analysis, Design, and Development	Singapore Cooperation Programme
Sixth College on Microprocessor-Based Real-Time Systems in Physics	International Center for Theoretical Physics
Formal training on Management Training	AusAID

## NON-TECHNICAL TRAININGS

COURSE / SEMINAR	ORGANIZER
Annual DLSU Science and Technology Conference (Robotics Demo)	De La Salle University
Congress of HRM Practitioners in the National Capital Region	Civil Service Commission
Accessibility and Accountability in Government Service	Government Association of Certified Public Accountants
Seminar on Accounting for Non-Accountants	SAADO, Commission on Audit
Records and Information Management in the IT Society	Philippine Records Management Association, Inc.
Extended Road Attitude Program for Drivers	Land Transportation Office
National IT Press Conference	International Center for Theoretical Physics
Accounting and Auditing Requirements for Government Expenditures	Commission on Audit
National Convention of Government Association of Certified Public Accountants	Government Association of Certified Public Accountants (GACPA)
Presentation of Tektronix Distribution products	Tektronix
Seminar-Workshop of Association of Government Accountants of the Philippines (AGAP)	Association of Government Accountants of the Philippines
Year-end Adjustment on Withholding Taxes	Bureau of Internal Revenue
IT/IS Planners/Coordinators Workshop	Department of Science and Technology
Information and Communications Technology Conference	University of the Philippines, Diliman
Conference on the Knowledge Economy: The Role of Information and Communication Technology	Department of Science and Technology, National Academy of Science and Technology Philippines, Advanced Science and Technology Institute



In an extensive planning workshop participated in by all its staff from January 10 to February 2, 2001, the technical divisions defined their five-year plans as well as their mission, objectives and strategies.

To spur local industry's global competitiveness, ASTI identified projects for 2001-2005 under three major program thrusts:

## **I. Information and Communications Technologies (ICT) Program**

The ICT Program shall address the Comprehensive Program to Enhance Technology Enterprises (COMPETE), which is among the priority flagship programs of the Department. COMPETE is aimed towards competence and competitiveness of all institutions involved in S&T activities and catalyzing R&D in the private sector to enhance its participation in S&T activities.

The ICT Program consists of three components, namely: **Advanced Networking Research**, **Wireless Technologies** and **Network Applications and Software**.

The **Advanced Networking Research** component seeks to develop competency in advanced networking technology, services, applications, and architecture; establish a national research and education network; develop, deploy, adapt, and adopt strategic networking technologies, services and applications. The component strengthens activities of the country in E-commerce, telemedicine and distance education not only by the infrastructure developed but also by the partnerships forged with research networks outside the Philippines.

The **Wireless Technologies** component aims to develop capability in fundamental design and implementation of industrial grade modules of wireless communications systems to a skill level that is able to produce world-class innovative wireless technologies. This involves development of devices, components, transmitter and receiver architectures; formulation of wireless broadband solutions; R&D at millimeter and sub-millimeter frequencies; and development of space-qualified communications systems.

The **Network Applications and Software** component aims to develop expertise in software development in network applications to produce marketable software and firmware products. The component engages on R&D on network applications such as



Dr. Sabido presenting to the staff the stages of the planning and their expected output.

E-commerce and related technologies; establishment of a testbed for either business-to-consumer or business-to-business commerce and development of E-commerce software and storefronts. Other network applications being looked into include IP telephony, video/image processing, Bluetooth, artificial intelligence, security and authentication, videoconferencing, among others.

## II. Microelectronics Program

Like the ICT Program, the **Microelectronics Program** also targets to achieve the goals of COMPETE. It intends to set-up a state-of-the-art microelectronics design facility where one can do quality R&D work; cultivate a skilled workforce adept in IC design through training and exposure to actual design work; and develop system-on-a-chip (SOC) capability within three years. Specific activities include research on low-power design and MEMS; study options for design flow using freeware; production of ARM chip; among others.



The Microelectronics Design Facility is envisioned to become a world-class training center.

Having envisioned to do projects that “cross divisional boundaries”, for 2001-2005, all of ASTI’s technical divisions will be consolidating their efforts to come up with the country’s first system-on-a-chip – an integration of all components of wireless devices for wireless technologies. This is in response to the predicted surge of demand for wireless devices in 2005.

## III. Technology Transfer Program

The **Technology Transfer Program** pursues dynamic assimilation of research results by industry, academe, NGO’s and government instrumentality. It aims to Transfer R&D outputs and advanced/specialized know-how through: 1. Technology diffusion/commercialization; 2. Collaborative R&D; 3. Conduct of trainings and seminars; and 4. Industry studies.



ASTI was an active participant of the first academe-industry ICT Conference held on December 13, 2000 at the UP Diliman.

The creation of the **Business Development Unit**, whose main function is to develop a marketing plan/strategy for promising technologies developed at ASTI strengthened the implementation of the program. Conceived by the ASTI Core Group, composed of ASTI officials on July 2000, BDU’s birth on November of the same year promised an organized, systematic and strategic technology transfer program for the Institute. Other responsibilities of the unit



include building relationships with potential partners for the Institute and looking into Intellectual Property Rights, Non-Disclosure Agreements, licensing, valuation, among others. Currently, the unit is looking into the possibilities of ASTI having a Product Engineering and Design Group whose scope will be limited to product/applications development. This is in response to the need of commercializing ASTI products and for technology transfer in addition to its being an income generating activity, which is essential to the Institute's future challenge of becoming a Government Owned and Controlled Corporation (GOCC).

## A GOCC in the Future

On August 2000, ASTI commissioned the Development Academy of the Philippines (DAP) to assess the current situation of ASTI (Phase I) and to define its corporate direction (Phase II). Phase I (survey) is almost completed (August to present) while Phase II has been moved to 2001.

The study was aimed to assess how ASTI as a research agency is faring at the moment and to determine how ASTI can best serve the country. It was participated by ASTI staff, DOST Executives, former employees, clients, partners in industry, academe and other GO's. A modified Mc Kinsey Framework was used to diagnose the Institute in terms of the following variables, namely: 1. Strategy and Purpose; 2. Structure; 3. Systems; 4. Staff; 5. Support for Organizational Change; 6. Style; and 7. Skills.

The study identified the strengths and weaknesses of the Institute. Results of the assessment include the following:

- ASTI is still in the best position to conduct R&D in the areas of ICT and microelectronics for the country considering its resources and network.
- Government needs to set direction and take the lead in promoting a culture of R&D in the country at this time.
- ASTI's identified core competencies, both present and future, necessitates some changes in its structure.

Together with Department Officials and the Technical Working Group for the review of the agency's mandate, it was then concluded that ASTI could best serve the country as a Government Owned and Controlled corporation (GOCC) with partial support from the government.

The Institute is currently preparing supporting documents for its move towards corporatization.



The results of the DAP Study showed a shared-value among the employees, which is, to be of service to the country.

# Organizational Profile

In carrying out its mandate to do R&D in the fields of Microelectronics and Information and Communications Technology, ASTI has six (6) divisions: two divisions overseeing the organization's planning, finance and administrative matters and four divisions engaging in research and development work.

The *Office of the Director (OD)* oversees the welfare of the agency. It is involved in the planning and monitoring of research programs, collaborative activities within and outside ASTI, direction setting and provision of pertinent services to its technical divisions such as facilitating their partnerships with external agencies. OD also serves as the liaison office, maintaining links with different offices in the public and private sectors as well as the academe.

Under this office are the newly created *Business Development Unit (BDU)* and *Project Management (PM) Group*. Both created on November 2000, the PM's and BDU's functions complement each other. While the PM looks into the internal aspects of the Institute like proposal generation, project planning, resource evaluation and allocation and organizational process improvement activities, the BDU on the other hand addresses the external needs of ASTI like developing a strategic marketing program for ASTI technologies, evaluating marketability of potential and existing technologies, product engineering and prototyping, and policy advocacy, among others.

The *Finance and Administrative (FAD) Division* provides general support and administrative services such as the management of its property, supply, financial, human resource and record. In providing these services, the division coordinates with agencies like the Civil Service Commission, Department of Budget and Management, Commission on Audit, among others. It also manages the agency's library of technical books, manuals, software, data books and leading technical journals and magazines.



CED Staff, in the CED Laboratory, occupied with their respective projects.

The *Communications Engineering Division (CED)* strives to contribute to the emergence and growth of a local communications engineering industry by concentrating its research efforts on radio frequency (RF) design, switching systems, embedded systems design, data communications and networking.

The *Microelectronics Division (MED)* seeks to develop a critical mass of integrated circuit design engineers in the country. It pays

special attention to Application Specific Integrated Circuit (ASIC) Design and IC prototype testing and verification. The division provides consultancy and training services for both low- and high-level design entries for integrated circuits. MED also undertakes joint product development through collaborative research with private companies and academic institutions.

The **Computer Software Division (CSD)** does research and development on embedded and application software, multimedia and networking technologies and application. It is this Division that develops and maintains ASTI's Management Information System and other network services.

The **Special Projects Division (SPD)** manages the Printed Circuit Board Laboratory used for the fabrication of PCB prototypes. The division provides general services such as PCB fabrication of single, double and multilayer PCB as well as PCB layout and design. SPD assists other technical divisions in their respective projects specifically in prototype fabrication, to reduce cost and turn-around time. The PCB Lab also extends services like single- and double-sided PCB fabrication, photoplotting and phototool fabrication, to institutions outside of ASTI.



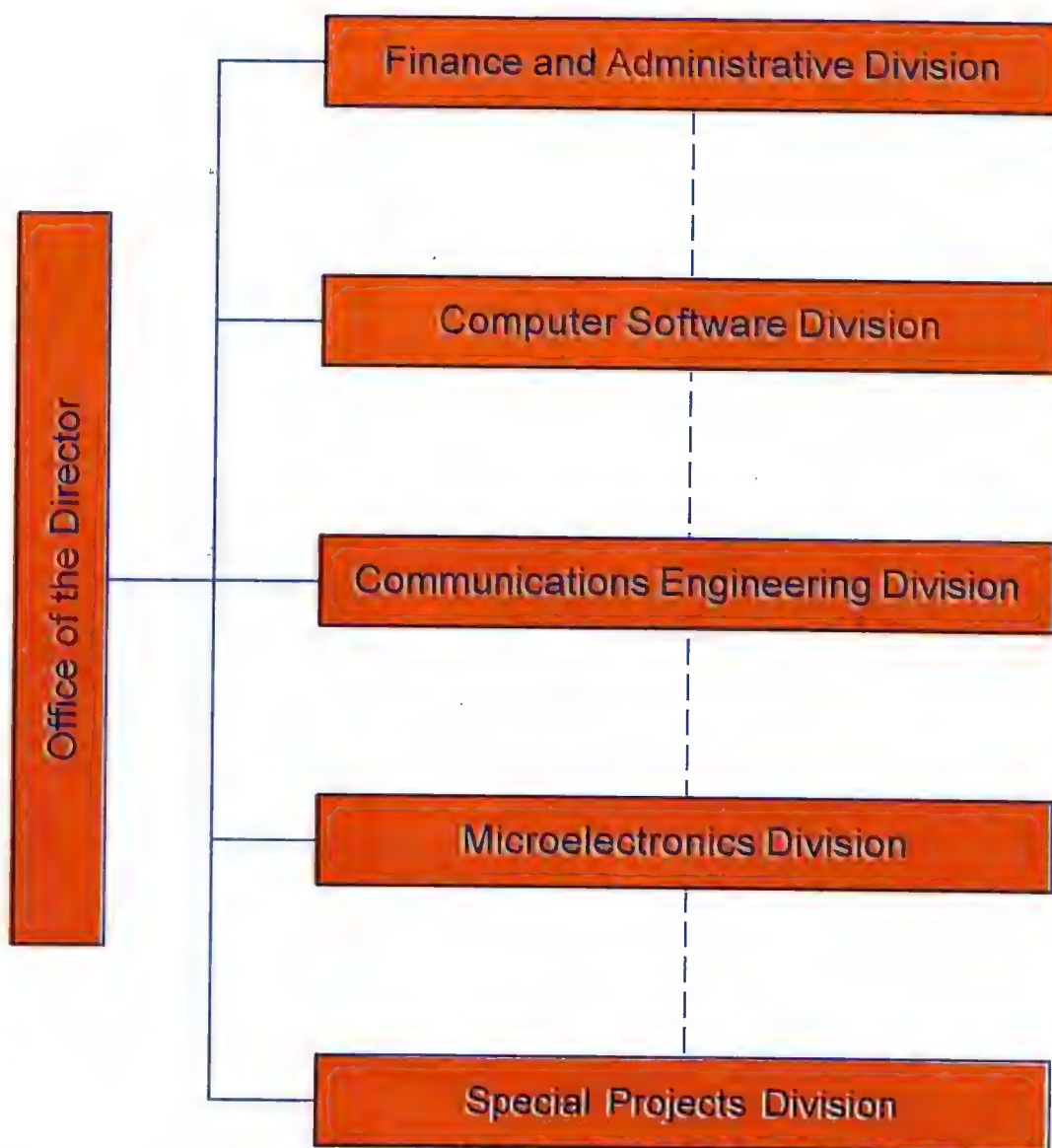
CSD staff managing the Institute's Management Information System .



SPD Staff manages and maintains the PCB Laboratory.



# *Organizational Chart*



The structure that has been operating since ASTI's establishment in 1987 has now evolved into one that involves collaboration among the four technical divisions of the Institute as shown by the broken line. This was the product of the Institute's vision to do projects that "cross-divisional boundaries". In this collaborative scheme, potentials of the expertise of the Institute's staffs are maximized.

This year, 2001, all technical divisions are merging their efforts in producing a system-on-a-chip for wireless technologies.

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 Narcisa Juvilyn Castaneda, Sylvia Alzona  
*(Front row)*  
 Leslie Chandran Gopalan, Beth Macapil,  
 Catherine Vargas, Emma Juco,  
**Dr. Delfin Jay Sabido IX (Director)**



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 Wilson Baustista, Fernando Calso,  
 Danilo Hapin  
*(Middle row)*  
 Marylou Rubillos, **Carmencita Echano**  
**(Chief)**, Gay Bugagao  
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 Milites Pedro, Antoniette Quintos,  
 Aurora Leonido

Not in picture: Joey Agustin



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 Toledo, Lloyd Sison, **Denis Villorente (OIC)**,  
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 Joanna Gonzales



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 Tabangcura



## Special Projects Division

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